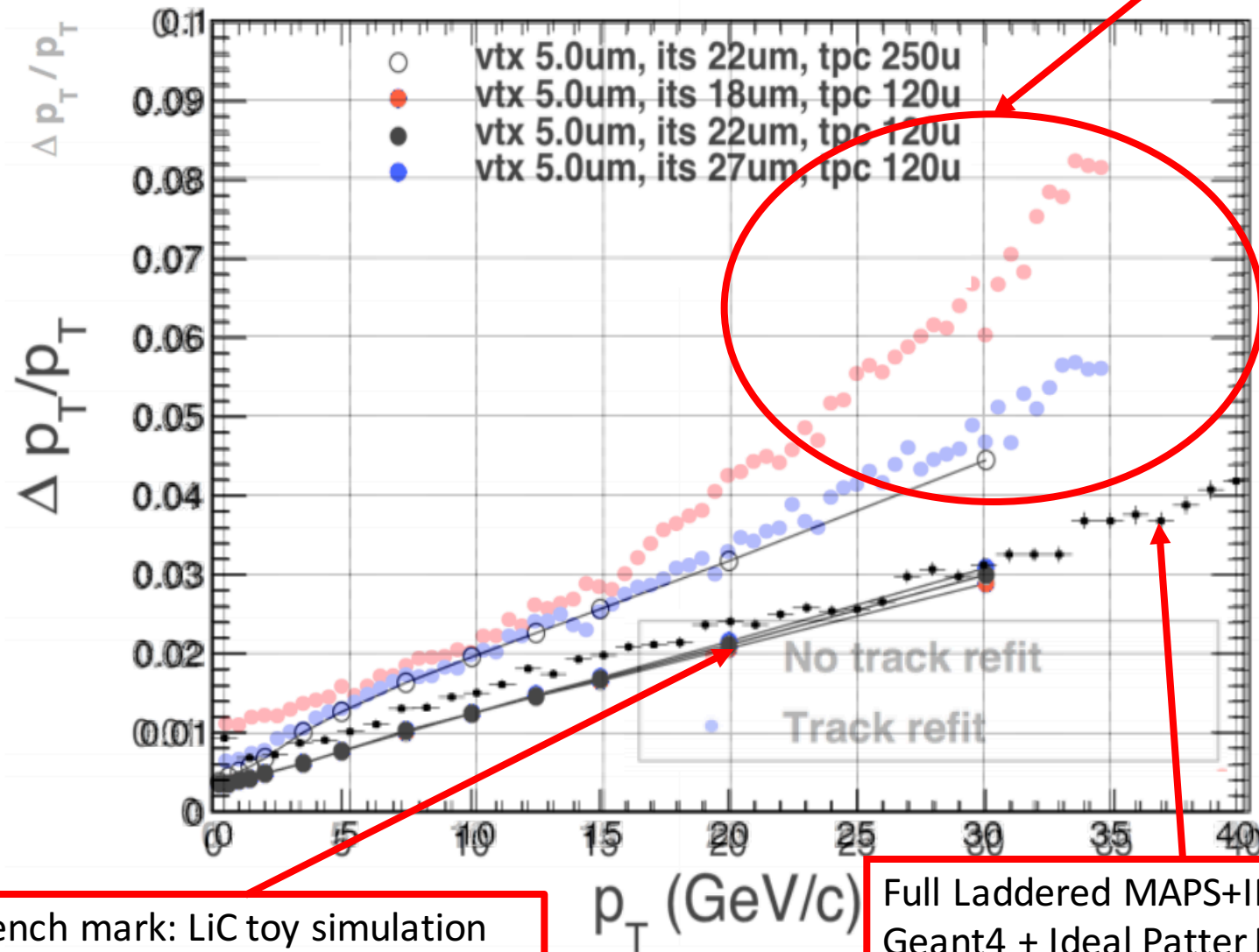


Update on Tracking Software

Jin Huang(BNL), Haiwang Yu (NMSU)

New Pattern Recognition Needed

Momentum resolution much worse than benchmarks



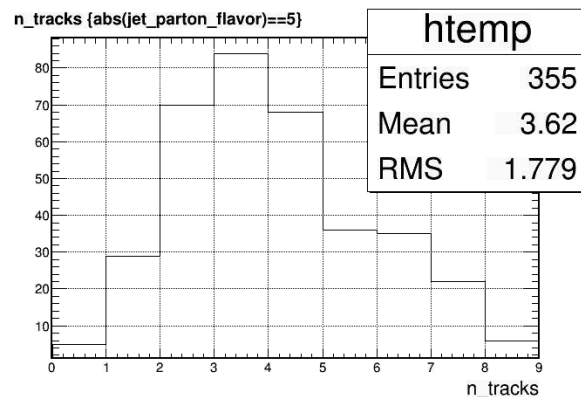
Bench mark: LiC toy simulation by Christof Roland

Full Laddered MAPS+INTT+TPC
Geant4 + Ideal Pattern Recognition
+ Full Kalman fit (GenFit2)

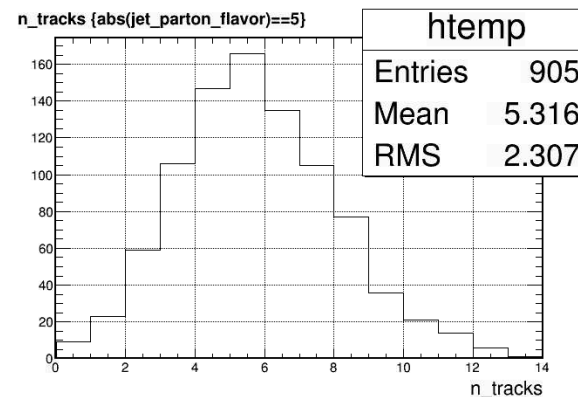
Alan's Hough for TPC: eff. and DCA tail

nTracks in jet cone
(5.3 - 3.6)/5.3 ~ 33%

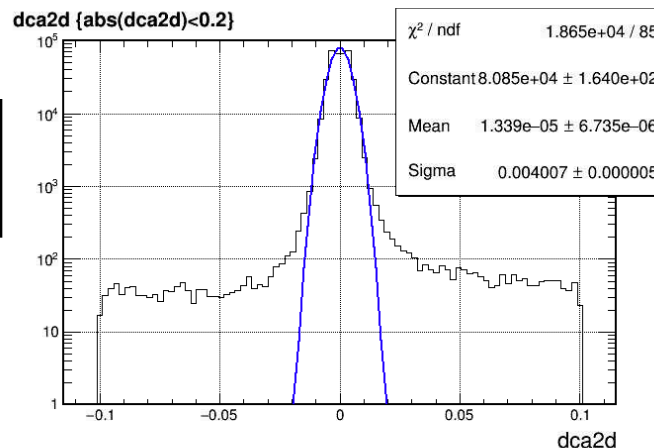
MAPS+INTT+TPC



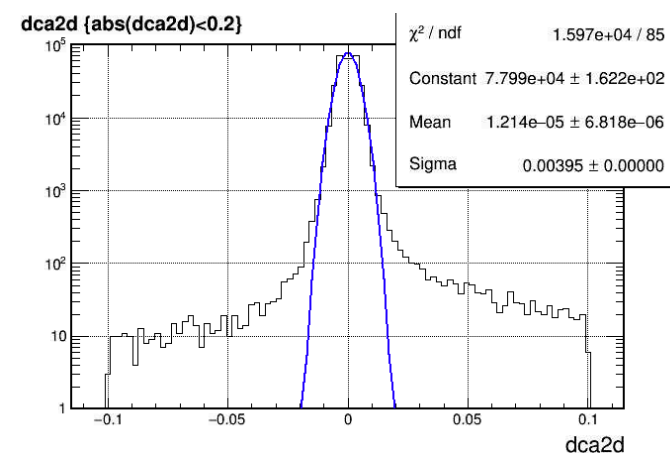
7-Layer MAPS



All tracks



No fake clusters



Large DCA tail
due to miss-association

A solution based on what we have

- Alan's Hough works well with 7 layer MAPS, doesn't work very well with TPC.
- GenFit works well with sPHENIX frame work.

A progressive tracking

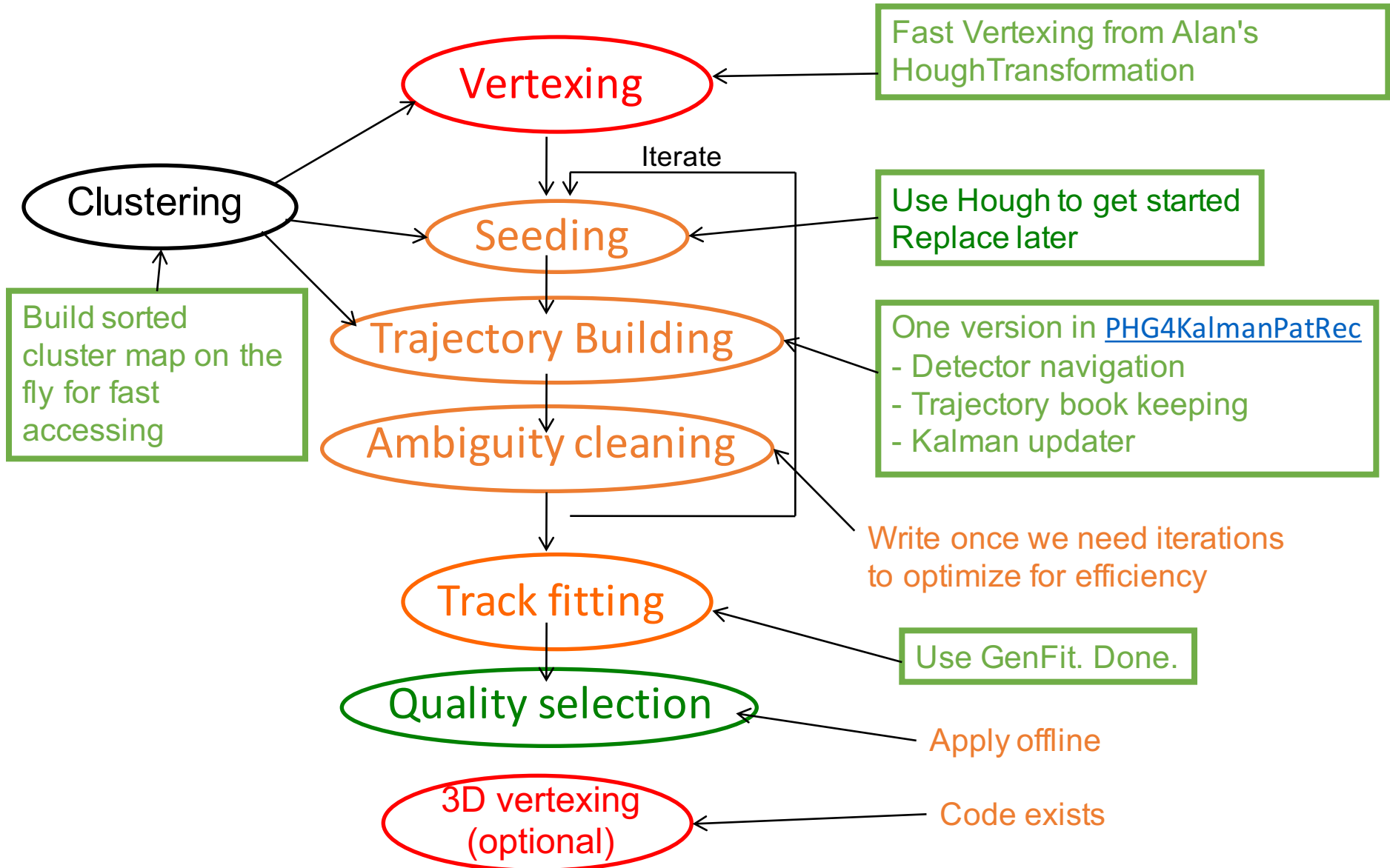
- with Alan's Hough to do the seeding using much less layers
- use GenFit track propagating to associate clusters in non-seeding layers.

This, in principal, only needs Alan's Hough to be efficient enough with the chosen seeding layers.

Progressive tracking

Christof Roland's proposal

Blocks needed



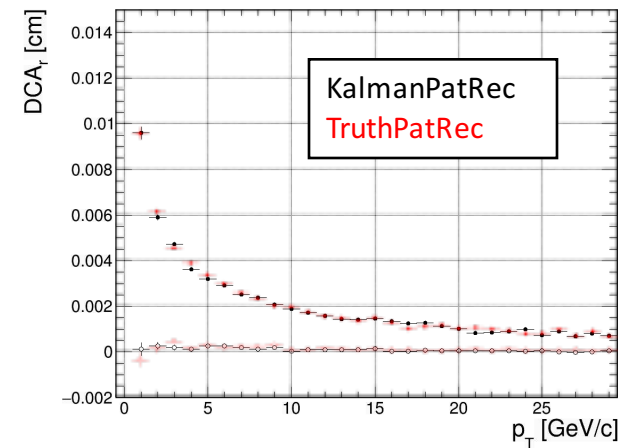
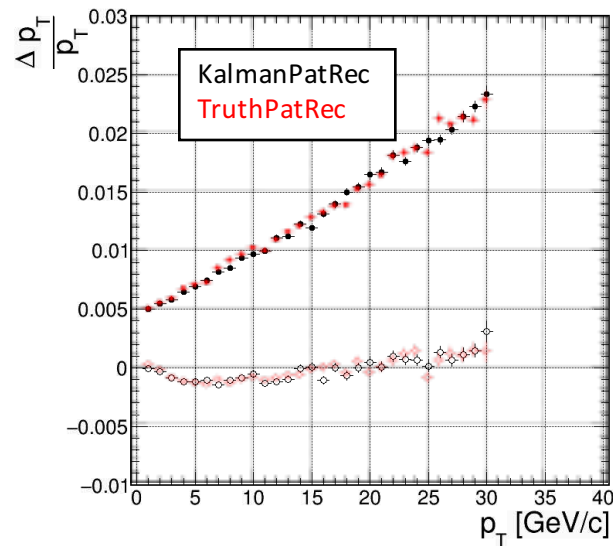
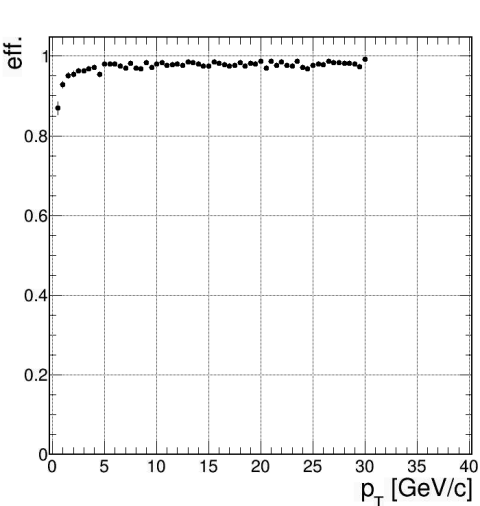
Single particle test 2017-05-12

Configure:

- Ladder MAPS + INTT + Cylindrical TPC (nightly build)
- single pion
- 0.5 - 30 GeV, $-0.5 < \eta < 0.5$

Cuts:

- 6/8 seeding (MAPS + 5 TPC)
- Search Win: 5σ
- $\chi^2 < 20$



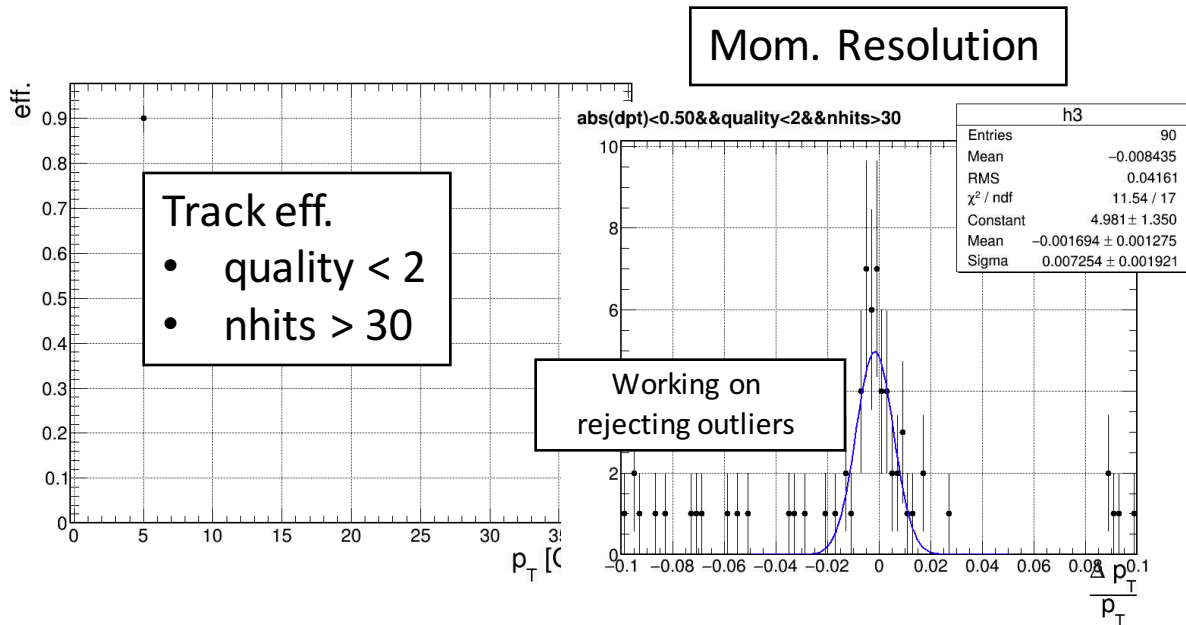
Hijing test 2017-05-12 - 5GeV pion embedding

Configure:

- Ladder MAPS + INTT + Cylindrical TPC (nightly build)
- 100 pions embedded in central Hijing event
- $p_T = 5 \text{ GeV}$, $-0.5 < \eta < 0.5$

Cuts:

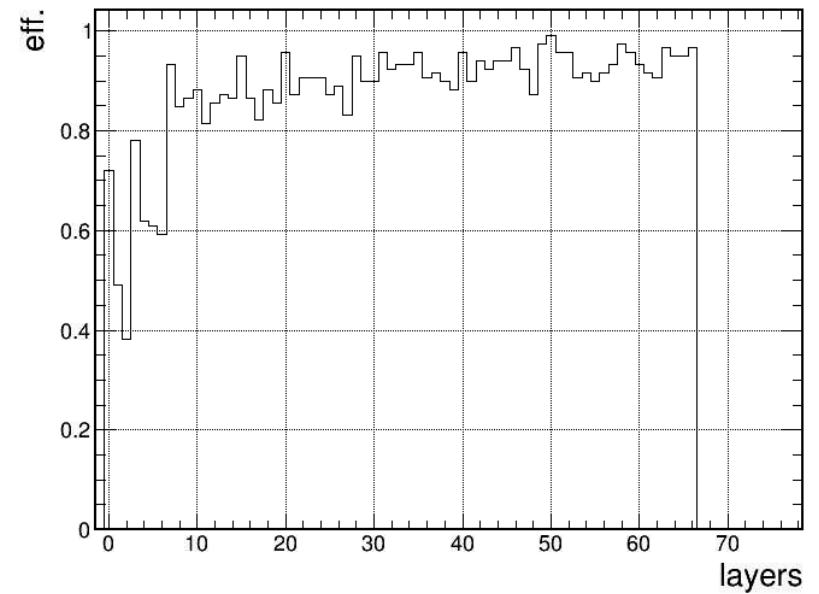
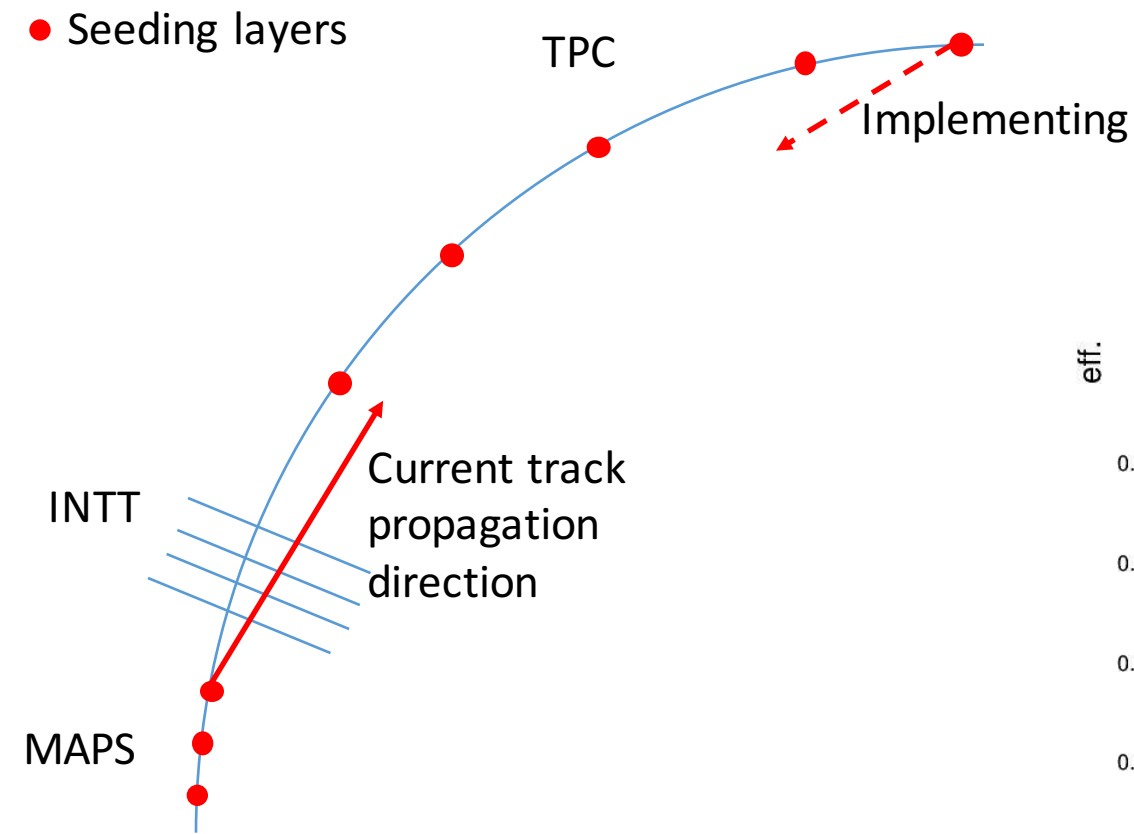
- 6/8 seeding (MAPS + 5 TPC)
- Search Win: 5σ
- $\chi^2 < 20$



Timers for Pattern Recognition

```
===== Timers: =====
Seeding time:                123.907 sec
  - Seeds Cleanup:           2.23723 sec
Pattern recognition time:     144.796 sec
  - Track Translation time:  57.5193 sec
  - Cluster searching time:  7.30252 sec
    - Encoding time:        0.365767 sec
    - Map iteration:        5.27908 sec
    - Kalman updater time:  52.9921 sec
```

Seeding and Track Propagating



Current status and next

- Force use truth vertex
 - try to use some BBC resolution

Need testing
- Seeding using Alan's Hough: helix param. and a pack of clusters
 - layers choice
 - min nlayer cut
 - seed merging

} Implemented
Needs fine tuning
- Initial Kalman Fitting: assign Kalman status to all clusters
- Track propagation
 - current: consecutively inside-out
 - next: optional inside-out or outside-in, do it twice?

Implementing
- Full fitting
 - Fatal exception handling

Needs to dig out exception location,
shouldn't be too hard

Key questions

Jin:

1) time scale that we can use it for b-jet finding

Targeting next Tue.

2) efficiency of track finding

3) suppress mis-association on MVTX

Xin:

DCA distribution, both core and tail

Will find these answers out after outside-in track propagating implemented

Backups

clusters: central Hijing
ladder silicon + cylindrical TPC

